

What is claimed is:

1. An ink jet ink or ink jet recording material comprising at least one compound selected from the group consisting of

a) the dialkyl hydroxylamine stabilizers,

b) the nitron stabilizers and

c) the amine oxide stabilizers.

2. An ink jet ink or ink jet recording material according to claim 1 which comprises at least one compound selected from the group consisting of the dialkyl hydroxylamine stabilizers.

3. An ink jet ink or ink jet recording material according to claim 2 where the dialkyl hydroxylamine stabilizers are of the formula



where

R_1 is alkyl of 1 to 36 carbon atoms, cycloalkyl of 5 to 12 carbon atoms or aralkyl of 7 to 9 carbon atoms; or R_1 is said alkyl, cycloalkyl or aralkyl substituted by one to six alkyl of 1 to 12 carbon atoms, perfluoroalkyl of 1 to 12 carbons atoms, halogen, cyano, E_1O- , E_1CO- , E_1OCO- , M^+O^-CO- , E_1COO- , E_1S- , E_1SO- , E_1SO_2- , $-NH_2$, $-NHE_1$, $-NE_1E_2$, $-PO(OE_1)(OE_2)$ or $-OPO(OE_1)(OE_2)$ groups;

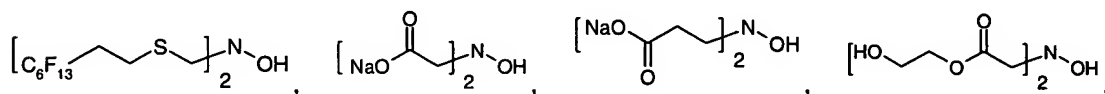
R_2 is hydrogen or independently has the same meaning as R_1 , where at least one of R_1 and R_2 contains a hydrogen alpha to the $-NOH$ moiety; or

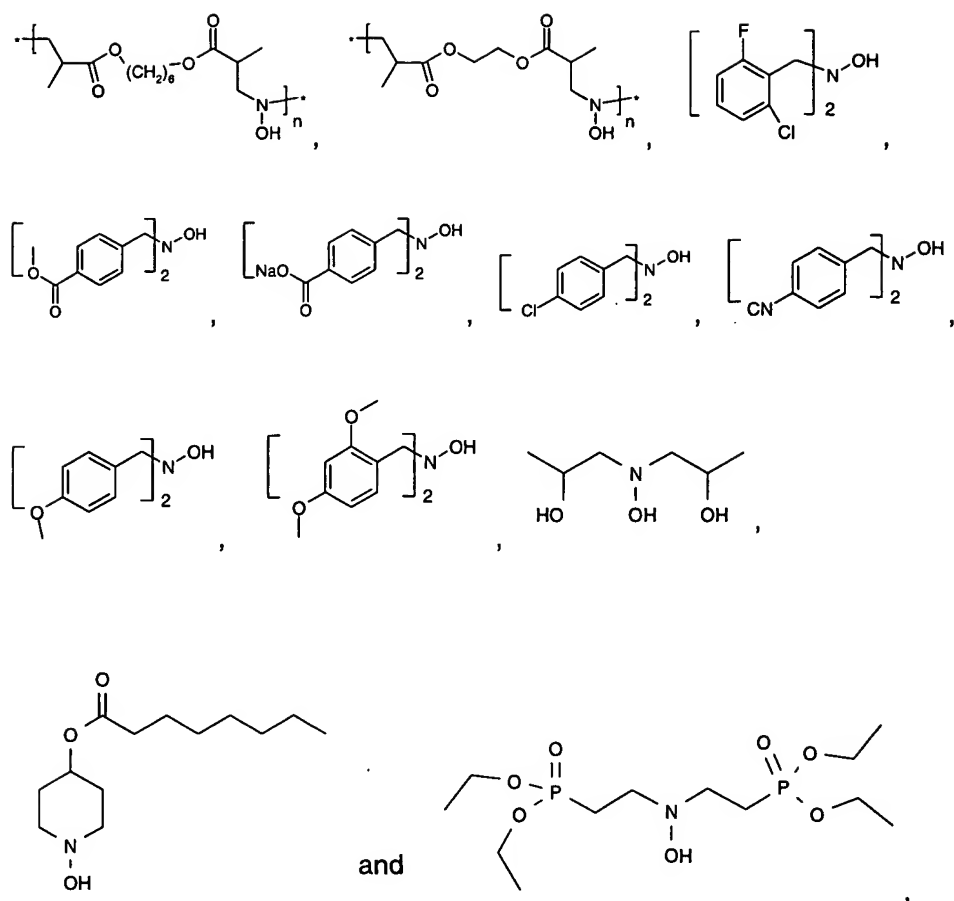
R_1 and R_2 together form a C_{2-12} heterocyclic ring which contains at least one carbon substituted hydrogen alpha to the $-NOH$ moiety, where said C_{2-12} heterocyclic ring is unsubstituted or is substituted by one to three alkyl of 1 to 12 carbon atoms, perfluoroalkyl of 1 to 12 carbon atoms, halogen, cyano, E_1O- , E_1CO- , E_1OCO- , M^+O^-CO- , E_1COO- , E_1S- , E_1SO- , E_1SO_2- , $-NH_2$, $-NHE_1$, $-NE_1E_2$, $-PO(OE_1)(OE_2)$ or $-OPO(OE_1)(OE_2)$ groups; or where said C_{2-12} heterocyclic ring is interrupted by one to three $-O-$, $-NE_1-$, $-CO-$, $-CONE_1-$, $-S-$, $-SO-$, $-SO_2-$, $-COO-$, $-PO_3-$ or $-PO_4E_1$ groups; or where said heterocyclic ring is both substituted and interrupted by said groups;

M^+ is a mono-, di- or tri-valent metal cation;

E_1 and E_2 independently are hydrogen, alkyl of 1 to 8 carbon atoms or alkyl of 1 to 8 carbon atoms substituted by one to three hydroxyl groups; or E_1 and E_2 independently are an oligomer of poly(ethylene glycol) or poly(propylene glycol) terminated by hydroxyl, methoxy, acetate or propionate, where the oligomer has a molecular weight up to about 500.

4. An ink jet ink or ink jet recording material according to claim 2 where the dialkyl hydroxylamine stabilizers are selected from the group consisting of N,N-dibenzylhydroxylamine, N,N-dimethylhydroxylamine, N,N-diethylhydroxylamine, N,N-bis(2-hydroxypropyl)hydroxylamine, N,N-bis(3-hydroxypropyl)hydroxylamine, N,N-bis(2-carboxyethyl)hydroxylamine, N,N-bis(benzylthiomethyl)hydroxylamine, N,N-dioctylhydroxylamine, N,N-dilaurylhydroxylamine, N,N-didodecylhydroxylamine, N,N-ditetradecylhydroxylamine, N,N-dihexadecylhydroxylamine, N,N-dioctadecylhydroxylamine, N-hexadecyl-N-tetradecylhydroxylamine, N-hexadecyl-N-heptadecylhydroxylamine, N-hexadecyl-N-octadecylhydroxylamine, N-heptadecyl-N-octadecylhydroxylamine, N-methyl-N-octadecylhydroxylamine, N,N-di(hydrogenated tallow)hydroxylamine,



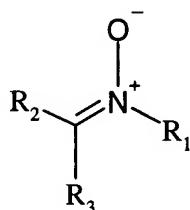


where $n = 2$ to 200.

5. An ink jet ink or ink jet recording material according to claim 2 where the dialkyl hydroxylamine stabilizers are N,N-diethylhydroxylamine, N,N-bis(2-hydroxypropyl)hydroxylamine, N,N-bis(3-hydroxypropyl)hydroxylamine, N,N-dibenzylhydroxylamine or N,N-di(hydrogenated tallow)hydroxylamine.

6. An ink jet ink or ink jet recording material according to claim 1 which comprises at least one compound selected from the group consisting of the nitron stabilizers.

7. An ink jet ink or ink jet recording material according to claim 6 where the nitron stabilizers are of the formula



wherein

R₁ is alkyl of 1 to 36 carbon atoms, cycloalkyl of 5 to 12 carbon atoms or aralkyl of 7 to 9 carbon atoms; or R₁ is said alkyl, cycloalkyl or aralkyl substituted by one to six alkyl of 1 to 12 carbon atoms, perfluoroalkyl of 1 to 12 carbon atoms, halogen, cyano, E₁O-, E₁CO-, M⁺O⁻CO-, E₁OCO-, E₁COO-, E₁S-, E₁SO-, E₁SO₂-, -NH₂, -NHE₁, -NE₁E₂, -PO(OE₁)(OE₂) or -OPO(OE₁)(OE₂) groups;

R₂ is hydrogen or independently has the same meaning as R₁; or

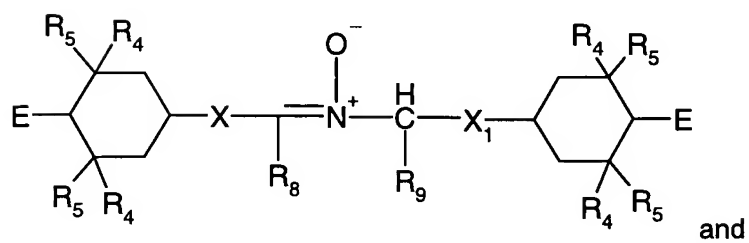
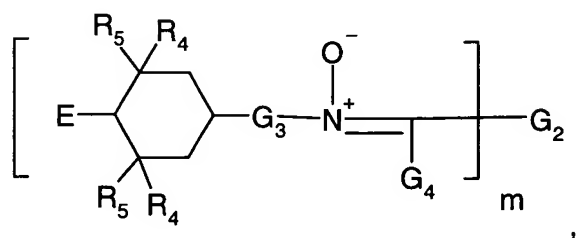
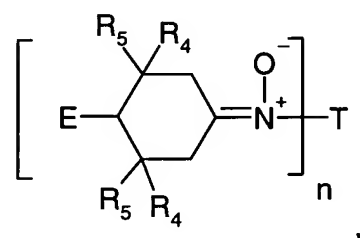
R₁ and R₂ together form a C₂₋₁₂heterocyclic ring which is unsubstituted or is substituted by one to three alkyl of 1 to 12 carbon atoms, perfluoroalkyl of 1 to 12 carbon atoms, halogen, cyano, E₁O-, E₁CO-, M⁺O⁻CO-, E₁OCO-, E₁COO-, E₁S-, E₁SO-, E₁SO₂-, -NH₂, -NHE₁, -NE₁E₂, -PO(OE₁)(OE₂) or -OPO(OE₁)(OE₂) groups; or where said C₂₋₁₂heterocyclic ring is interrupted by one to three -O-, -NE₁-, -CO-, -CONE₁-, -S-, -SO-, -SO₂-, -COO-, -PO₃- or -PO₄E₁ groups; or where said heterocyclic ring is both substituted and interrupted by said groups;

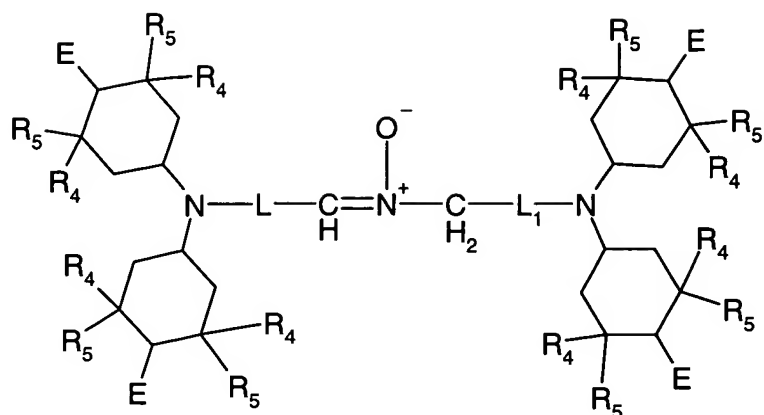
E₁ and E₂ independently are hydrogen, alkyl of 1 to 8 carbon atoms or alkyl of 1 to 8 carbon atoms substituted by one to three hydroxyl groups; or E₁ and E₂ independently are an oligomer of poly(ethylene glycol) or poly(propylene glycol) terminated by hydroxyl,

methoxy, acetate or propionate, where the oligomer has a molecular weight up to about 500;
and

R_3 independently has the same meaning as R_1 ;

or the nitrones are of the formula





wherein

E is hydrogen, oxyl, hydroxyl, alkyl of 1 to 18 carbon atoms, alkenyl of 3 to 18 carbon atoms, cycloalkyl of 5 to 12 carbon atoms, hydroxyalkyl of 2 to 6 carbon atoms, alkoxyalkyl of 2 to 20 carbon atoms, alkanoyl of 1 to 18 carbon atoms, alkoxy of 1 to 18 carbon atoms, cycloalkoxy of 5 to 12 carbon atoms, aryloxy of 6 to 10 carbon atoms, hydroxyalkoxy of 2 to 6 carbon atoms, alkoxyalkoxy of 2 to 20 carbon atoms, aralkoxy of 7 to 15 carbon atoms or a bicyclo or tricycloaliphatic oxy radical of 7 to 12 carbon atoms,

R₄ and R₅ are independently alkyl of 1 to 4 carbon atoms or together R₃ and R₄ are pentamethylene,

n is 1, 2, 3 or 4,

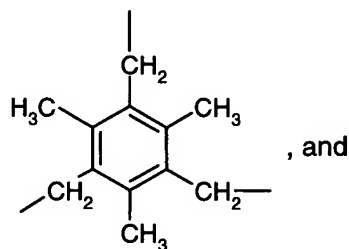
when n is 1, T is alkyl of 1 to 36 carbon atoms, cycloalkyl of 5 to 12 carbon atoms, aralkyl of 7 to 9 carbon atoms or aralkyl of 7 to 9 carbon atoms substituted by alkyl of 1 to 4 carbon atoms or by one or two halogen atoms, said alkyl interrupted by one or more oxygen atoms, cyanoethyl, alkenyl of 3 to 8 carbon atoms, alkoxyalkonylalkyl of 4 to 36 carbon atoms where alkyl is of 1 to 4 carbon atoms,

when n is 2, T is alkylene of 2 to 12 carbon atoms, arylene of 6 to 10 carbon atoms,

xylylene, $-\text{CH}_2\text{CHOHCH}_2-$, $-\text{CH}_2\text{CHOHCH}_2-\text{O}-\text{G}_1-\text{O}-\text{CH}_2\text{CHOHCH}_2-$, $-\text{CH}_2\text{-phenylene-COO-}$
 $\text{G}_1\text{-OCO-phenylene-CH}_2-$ or $-\text{CH}_2\text{-phenylene-CH}_2\text{-OCO-G}_1\text{-COO-CH}_2\text{-phenylene-CH}_2-$,

G_1 is alkylene of 2 to 12 carbon atoms, arylene of 6 to 10 carbon atoms or
cycloalkylene of 6 to 12 carbon atoms,

when n is 3, T is alkanetriyl of 3 to 6 carbon atoms, or is



when n is 4, T is alkanetetrayl of 4 to 6 carbon atoms,

G_3 is a direct bond, $-\text{OCO}-(\text{C}_q\text{H}_{2q})_q-$, $-\text{OCO-phenylene-CH}_2-$, $-\text{NG}_4\text{-CO}-(\text{C}_q\text{H}_{2q})_q-$ or
 $-\text{NG}_4\text{-CO-phenylene-CH}_2-$ where q is 1 to 12,

G_4 is hydrogen, alkyl of 1 to 8 carbon atoms or phenyl,

m is 1 or 2,

when m is 1, G_2 is alkyl of 1 to 36 carbon atoms, said alkyl interrupted by one or
more oxygen atoms, cyanomethyl, cycloalkyl of 6 to 8 carbon atoms, alkenyl of 2 to 8 carbon
atoms, aryl of 6 to 10 carbon atoms, or aryl of 6 to 10 carbon atoms substituted by alkyl of 1
to 4 carbon atoms or by one or two halogen atoms, or alkoxy carbonylalkyl of 4 to 36 carbon
atoms where alkyl is of 1 to 4 carbon atoms, and

when m is 2, G_2 is alkylene of 2 to 12 carbon atoms or arylene of 6 to 10 carbon
atoms,

X and X_1 are independently Q-G , where Q is $-\text{O}-$, $-\text{COO}-$, $-\text{OCO}-$ or $-\text{NR}_6-$,

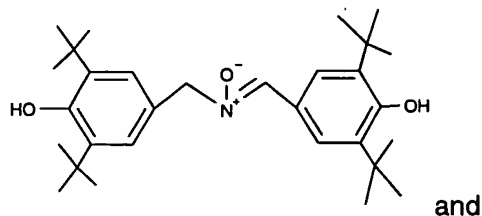
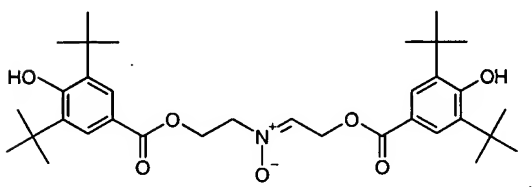
R_6 is hydrogen, alkyl of 1 to 8 carbon atoms, cycloalkyl of 5 to 12 carbon atoms, cyanoethyl, aryl of 6 to 10 carbon atoms, aralkyl of 7 to 15 carbon atoms or $-\text{CH}_2\text{CHR}_7\text{OH}$, and R_7 is hydrogen, methyl or phenyl, with Q being attached to the piperidinyl ring,

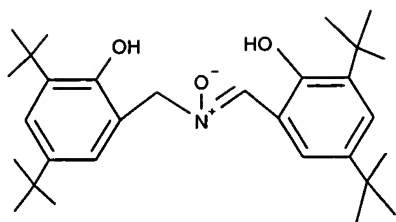
G is alkylene of 1 to 4 carbon atoms, arylene of 6 to 10 carbon atoms or arylene-alkylene of 7 to 15 carbon atoms,

R_8 and R_9 are independently hydrogen or alkyl of 1 to 8 carbon atoms, and

L and L_1 are independently $-\text{CO}-$ alkylene of 2 to 5 carbon atoms or $-\text{CO}-$ phenylene- with the carbonyl group being attached to the N atom.

8. An ink jet ink or ink jet recording material according to claim 6 where the nitron stabilizers are selected from the group consisting of N-benzyl- α -phenylnitron, N-ethyl- α -methylnitron, N-octyl- α -heptylnitron, N-lauryl- α -undecylnitron, N-tetradecyl- α -tridcylnitron, N-hexadecyl- α -pentadecylnitron, N-octadecyl- α -heptadecylnitron, N-hexadecyl- α -heptadecylnitron, N-octadecyl- α -pentadecylnitron, N-heptadecyl- α -heptadecylnitron, N-octadecyl- α -hexadecylnitron, N-methyl- α -heptadecylnitron, the nitron derived from N,N-di(hydrogenated tallow)hydroxylamine, N-benzyl- α -methylnitron, N-butyl- α -propylnitron,





9. An ink jet ink or ink jet recording material according to claim 6 where the nitronium stabilizers are N-benzyl- α -phenylnitronium or N-ethyl- α -methylnitronium.

10. An ink jet ink or ink jet recording material according to claim 7 in which E is hydrogen, hydroxyl, alkyl of 1 to 12 carbon atoms, alkyl, benzyl, alkanoyl of 2 to 4 carbon atoms, alkoxy of 1 to 12 carbon atoms, cyclohexyloxy or alpha-methylbenzyloxy.

11. An ink jet ink or ink jet recording material according to claim 7 in which

R_4 and R_5 are each methyl,

when n is 1, T is hydrogen, alkyl of 1 to 18 carbon atoms, benzyl or alkoxyalkyl of 4 to 18 carbon atoms where the alkyl is of 2 to 4 carbon atoms,

when n is 2, T is alkylene of 2 to 8 carbon atoms or is p-xylylene,

when n is 3, T is glyceryl,

when n is 4, T is pentaerythritol,

G_3 is a direct bond,

G_4 is hydrogen,

when m is 1, G₂ is alkyl of 1 to 12 carbon atoms or phenyl,

when m is 2, G₂ is alkylene of 3 to 8 carbon atoms or phenylene,

X and X₁ are the same,

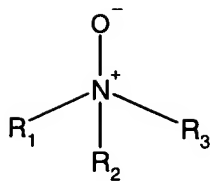
R₈ and R₉ are each hydrogen, and

L and L₁ are the same and are -CO-CH₂- or -CO-phenylene-.

12. An ink jet ink or ink jet recording material according to claim 6 where the nitron stabilizers are selected from the group consisting of α -phenyl-N-(2,2,6,6-tetramethylpiperidin-4-yl)nitron, α -phenyl-N-(1,2,2,6,6-pentamethylpiperidin-4-yl)nitron, α -phenyl-N-(1-cyclohexyloxy-2,2,6,6-tetramethylpiperidin-4-yl)nitron, α -phenyl-N-(1-octyloxy-2,2,6,6-tetramethylpiperidin-4-yl)nitron, α,α' -p-phenylene-N,N'-bis[(2,2,6,6-tetramethylpiperidin-4-yl)nitron], N-benzyl-N-(1-cyclohexyloxy-2,2,6,6-tetramethylpiperidin-4-ylidene)amine-N-oxide, α -n-propyl-N-(1-cyclohexyloxy-2,2,6,6-tetramethylpiperidin-4-yl)nitron, α -isopropyl-N-(1-octyloxy-2,2,6,6-tetramethylpiperidin-4-yl)nitron, α,α' -tetramethylene-N,N'-bis[(1-octyloxy-2,2,6,6-tetramethylpiperidin-4-yl)nitron], α -n-propyl-N-(1-acetyl-2,2,6,6-tetramethylpiperidin-4-yl)nitron and α -[4-(1-cyclohexyloxy-2,2,6,6-tetramethylpiperidin-4-yloxy)carbonyl]-phenyl-N-[4-(1-cyclohexyloxy-2,2,6,6-tetramethylpiperidin-4-yloxy)carbonyl]benzyl]nitron.

13. An ink jet ink or ink jet recording material according to claim 1 comprising at least one compound selected from the group consisting of the amine oxide stabilizers.

14. An ink jet ink or ink jet recording material according to claim 13 where the amine oxide stabilizers are of the formula



wherein

R_1 is alkyl of 1 to 36 carbon atoms, cycloalkyl of 5 to 12 carbon atoms or aralkyl of 7 to 9 carbon atoms; or R_1 is said alkyl, cycloalkyl or aralkyl substituted by one to six alkyl of 1 to 12 carbon atoms, perfluoroalkyl of 1 to 12 carbon atoms, halogen, cyano, $\text{E}_1\text{O}-$, $\text{E}_1\text{CO}-$, $\text{M}^+\text{O}^-\text{CO}-$, $\text{E}_1\text{OCO}-$, $\text{E}_1\text{COO}-$, $\text{E}_1\text{S}-$, $\text{E}_1\text{SO}-$, E_1SO_2- , $-\text{NH}_2$, $-\text{NHE}_1$, $-\text{NE}_1\text{E}_2$, $-\text{PO}(\text{OE}_1)(\text{OE}_2)$ or $-\text{OPO}(\text{OE}_1)(\text{OE}_2)$ groups;

R_2 is hydrogen or independently has the same meaning as R_1 ; or

R_1 and R_2 together form a C_{2-12} heterocyclic ring which is unsubstituted or is substituted by one to three alkyl of 1 to 12 carbon atoms, perfluoroalkyl of 1 to 12 carbon atoms, halogen, cyano, $\text{E}_1\text{O}-$, $\text{E}_1\text{CO}-$, $\text{M}^+\text{O}^-\text{CO}-$, $\text{E}_1\text{OCO}-$, $\text{E}_1\text{COO}-$, $\text{E}_1\text{S}-$, $\text{E}_1\text{SO}-$, E_1SO_2- , $-\text{NH}_2$, $-\text{NHE}_1$, $-\text{NE}_1\text{E}_2$, $-\text{PO}(\text{OE}_1)(\text{OE}_2)$ or $-\text{OPO}(\text{OE}_1)(\text{OE}_2)$ groups; or where said C_{2-12} heterocyclic ring is interrupted by one to three $-\text{O}-$, $-\text{NE}_1-$, $-\text{CO}-$, $-\text{CONE}_1-$, $-\text{S}-$, $-\text{SO}-$, $-\text{SO}_2-$, $-\text{COO}-$, $-\text{PO}_3-$ or $-\text{PO}_4\text{E}_1$ groups; or where said heterocyclic ring is both substituted and interrupted by said groups;

E_1 and E_2 independently are hydrogen, alkyl of 1 to 8 carbon atoms or alkyl of 1 to 8 carbon atoms substituted by one to three hydroxyl groups; or E_1 and E_2 independently are an oligomer of poly(ethylene glycol) or poly(propylene glycol) terminated by hydroxyl, methoxy, acetate or propionate, where the oligomer has a molecular weight up to about 500; and

R_3 independently has the same meaning as R_1 ;

wherein at least one of R_1 , R_2 and R_3 contains a β carbon-hydrogen bond.

15. An ink jet ink or ink jet recording material according to claim 14 where R_1 and R_2 are independently benzyl or substituted benzyl.

16. A composition according to claim 14 in which R_1 and R_2 are independently alkyl groups of 8 to 26 carbon atoms and R_3 is methyl.

17. A composition according to claim 14 in which R_1 , R_2 and R_3 are independently alkyl groups of 6 to 36 carbon atoms.

18. A composition according to claim 14 in which the amine oxide stabilizer is di(C_{16} - C_{18})alkyl methyl amine oxide, CAS# 204933-93-7.

19. An ink jet ink or ink jet recording material according to claim 1 comprising

at least one compound selected from the group consisting of a) the dialkyl hydroxylamine stabilizers and at least one compound selected from the group consisting of b) the nitron stabilizers or

at least one compound selected from the group consisting of a) the dialkyl hydroxylamine stabilizers and at least one compound selected from the group consisting of c) the amine oxide stabilizers or

at least one compound selected from the group consisting of b) the nitron stabilizers and at least one compound selected from the group consisting of c) the amine oxide stabilizers.

20. An ink jet ink according to claim 1 which comprises about 0.01 to about 30% by weight of at least one compound selected from the group consisting of components a), b) and c), based on the weight of the ink jet ink.

21. An ink jet recording material according to claim 1 which comprises about 1 to about 10000 mg/m² of at least one compound selected from the group consisting of components a), b) and c).

22. An ink jet ink or ink jet recording material according to claim 1 further comprising a UV absorber selected from the group consisting of the hydroxyphenylbenzotriazoles, the tris-aryl-s-triazines, the benzophenones, the α -cyanoacrylates, the oxanilides, the benzoxazinones, the benzoates and the α -alkyl cinnamates.

23. An ink jet ink or ink jet recording material according to claim 1 further comprising a UV absorber selected from the group consisting of the hydroxyphenylbenzotriazoles, the tris-aryl-s-triazines and the benzophenones.

24. An ink jet ink or ink jet recording material according to claim 1 further comprising a UV absorber selected from the group consisting of

5-chloro-2-(2-hydroxy-3,5-di-tert-butylphenyl)-2H-benzotriazole;
2-(2-hydroxy-3,5-di-tert-butylphenyl)-2H-benzotriazole;
2-(2-hydroxy-3,5-di-tert-amylphenyl)-2H-benzotriazole;
2-(2-hydroxy-3,5-di- α -cumylphenyl)-2H-benzotriazole;
2-(2-hydroxy-3- α -cumyl-5-tert-octylphenyl)-2H-benzotriazole;
2-(2-hydroxy-5-tert-octylphenyl)-2H-benzotriazole;
2-(2-hydroxy-5-methylphenyl)-2H-benzotriazole;
2-(2-hydroxy-3-tert-butyl-5-methylphenyl)-2H-benzotriazole-5-sulfonic acid, sodium salt;

3-tert-butyl-4-hydroxy-5-(2H-benzotriazol-2-yl)-hydrocinnamic acid;
 12-hydroxy-3,6,9-trioxadodecyl 3-tert-butyl-4-hydroxy-5-(2H-benzotriazol-2-yl)-hydro-
 cinnamate;
 octyl 3-tert-butyl-4-hydroxy-5-(2H-benzotriazol-2-yl)-hydrocinnamate;
 2-(3-tert-butyl-2-hydroxy-5-(2-(ω -hydroxy-octa-(ethyleneoxy)carbonyl-ethyl)-phenyl)-2H-
 benzotriazole;
 4,6-bis(2,4-dimethylphenyl)-2-(4-octyloxy-2-hydroxyphenyl)-s-triazine;
 2,4-bis(2-hydroxy-4-butyloxyphenyl)-6-(2,4-bis-butyloxyphenyl)-1,3,5-triazine;
 2-[4-(dodecyloxy/tridecyloxy-2-hydroxypropoxy)-2-hydroxyphenyl]-4,6-bis(2,4-
 dimethylphenyl)-1,3,5-triazine;
 the reaction product of tris(2,4-dihydroxyphenyl)-1,3,5-triazine with the mixture of α -
 chloropropionic esters (made from isomer mixture of C₇-C₉alcohols);
 2,4-dihydroxybenzophenone;
 2,2',4,4'-tetrahydroxy-5,5'-disulfobenzophenone, disodium salt;
 2-hydroxy-4-octyloxybenzophenone;
 2-hydroxy-4-dodecyloxybenzophenone;
 2,4-dihydroxybenzophenone-5-sulfonic acid and salts thereof;
 2-hydroxy-4-methoxybenzophenone-5-sulfonic acid and salts thereof;
 2,2'-dihydroxy-4,4'-dimethoxybenzophenone-5,5'-disodium sulfonate;
 3-(2H-benzotriazol-2-yl)-4-hydroxy-5-sec-butylbenzenesulfonic acid, sodium salt; and
 2-(2'-hydroxy-3'-tert-butyl-5'-polyglycolpropionate-phenyl)benzotriazole.

25. An ink jet system, comprising a recording material and at least one colored ink to be
 applied to the recording material by means of an ink jet nozzle, wherein at least either the
 recording material or at least one colored ink comprises at least one compound selected
 from the group consisting of

- a) the dialkyl hydroxylamine stabilizers,
- b) the nitron stabilizers and
- c) the amine oxide stabilizers.

26. A process for stabilizing ink jet prints which comprises applying to a recording material for ink jet printing an ink composition comprising a water soluble dye or a solution of a dye in an organic solvent and at least one compound selected from the group consisting of

- a) the dialkyl hydroxylamine stabilizers,**
- b) the nitron stabilizers and**
- c) the amine oxide stabilizers and**

drying said recording material.

27. A process for stabilizing ink jet prints which comprises applying to a recording material for ink jet printing a casting or coating dispersion or an aqueous or organic solution comprising at least one compound selected from the group consisting of

- a) the dialkyl hydroxylamine stabilizers,**
- b) the nitron stabilizers and**
- c) the amine oxide stabilizers and**

further applying either an ink composition comprising a water soluble dye or a solution of a dye in an organic solvent; or an ink composition comprising a water soluble dye or a solution of a dye in an organic solvent and at least one compound selected from the group consisting of components a), b) and c) and drying said recording material.